User Operation & Maintenance Manual

FS71C-85-USR

800 MHz Digital Narrowband Repeater Unit

Fiber-Span

RF ON FIBER® EXPERTS

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Warnings

An exclamation point denotes attention to statement required.

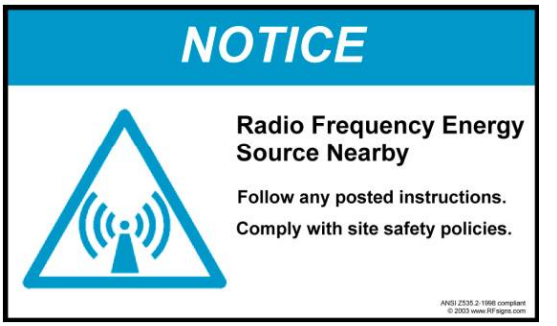
Only a qualified technician shall be allowed to operate the unit after reading and understanding all the guidelines in this manual.

Follow and comply with all site Safety Policies.

Do not touch heat sink while equipment is in operation, as surface may be very **HOT**.

Terminate every RF port with a 50 Ohm load.

Note: Factory limit is set to +37 dBm composite output power for both UL & DL paths.



Part 20 & 90 Signal Boosters

THIS IS A 90.219 CLASS A DEVICE"

"WARNING. This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at HYPERLINK "http://www.fcc.gov/signal-boosters/registration" www.fcc.gov/signal-boosters/registration. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation."

Part 20 Industrial Boosters

"WARNING. This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation."

Revision History

Information in this document is subject to change without notice.

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Version	Description	Date	Author
1.0	Initial Release	01-Aug-2014	DT
1.1	GUI Screen shots and descriptions updated	01-Feb-2015	HW
1.1a	pg18 DL Setup	25-Feb-2015	HW
1.1k	FCC statement clarified	10-Aug-2015	HW
1.1L	FCC statement updated	12-Oct-2015	HW
1.1m	FCC Website Link Correction	14-Oct-2015	LT
1.1n	FCC statement update on pg. 31	29-Oct-2015	LT

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1 Company Information

Fiber-Span is a premier provider of advanced RF ON FIBER® technologies and solutions for fiber optic based transmission of high performance radio-frequency wireless voice, data and multiservice networking applications.

Fiber-Span offers a full line of fibered and non-fibered wireless coverage solutions including Distributed Antenna Systems, Bidirectional Amplifiers, Digital Narrowband DSP based Repeaters and fiber optic distribution gear. Full featured solutions include redundancy, Network Management Systems and remote web-based access capability.

Fiber-Span is addressing public safety needs by providing fiber optic wireless solutions for police, fire, emergency, first responder and Homeland Security radio systems applications. Fiber-Span's solutions for Defense and Military organizations are also leading the way by providing reliable and secure communications links for ground, airborne, shipboard, radar, telemetry, GPS and intelligence solutions in the HF/VHF/UHF and microwave radio frequencies.

Fiber-Span's evolving class of product addresses the growing demand and movement toward the convergence of wire line and wireless networks, and the requirement for high performance, high bandwidth RF ON FIBER® solutions and networks.

Fiber-Span's customers are global wireless communication systems original equipment manufacturers (OEM), radio frequency (RF) system integrators, and military system architects. More information about Fiber-Span products is available from the contact info listed below.

Contact

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2 Product Introduction

This manual covers the **Digital Narrowband Headend Repeater Unit** (D**HRU**)., model **FS71C-85**. The DHRU is the off-air interface to the Distributed Antenna System (DAS) and is typically fed donor signals by coaxial cable from one or more off-air antennas. On the DAS side, the HRU may be connected directly via coaxial cable, or optionally, to **RRUs** via **BSU** (Base Station Interface Unit) and one or more **FTUs** (Fiber Transceiver Unit).

The following diagram illustrates how the DHRU fits into the Fiber-Span System Architecture.

DHRU - Digital Headend Repeater Unit
IHU - Integrated Headend Repeater Unit
BSU - Base Station Interface Unit
FTU - Fiber Transceiver Unit
RRU - Remote Repeater Unit
CRRU - Compact Remote Repeater Unit
BTS - Base Transceiver System
GPS - Global Positioning System

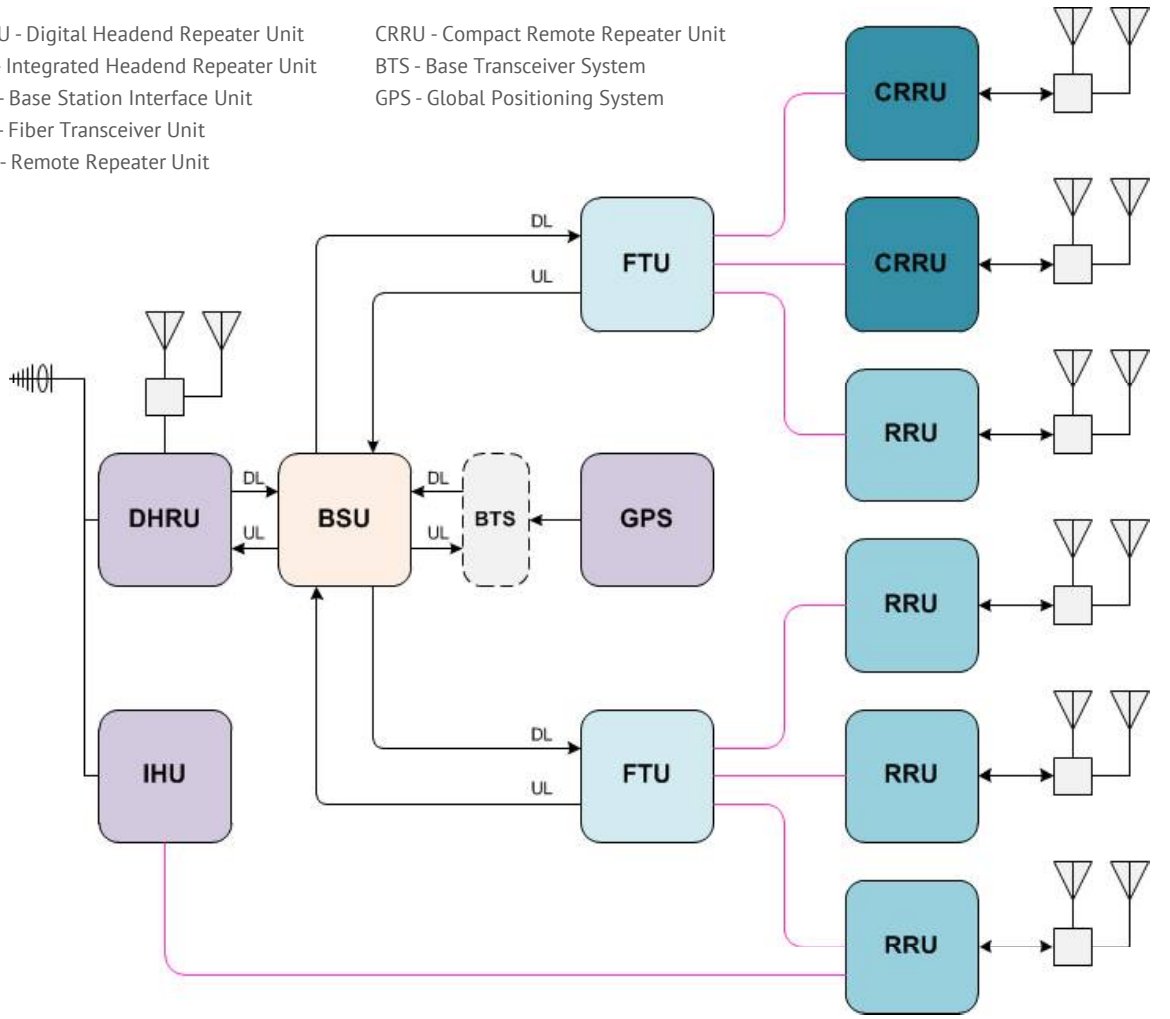


Figure 1. Fiber-Span System Architecture & Product Family

Most applications for simple coverage enhancement solutions would require a Bi-Directional Amplifier (BDA).

The DHRU is Fiber-Span's technology equivalent to the BDA, with the additional functionality of a DSP processore that digitally filters the incoming signals with precise narrowband filters centered around each incoming individual channel. The DHRU also allows for local coverage via a downlink power amplifier plus a direct connection to fiber-optic transceivers for feeding a fiber DAS.

The DHRU amplifies RF frequencies in both the downlink and uplink paths with duplexers that provide both downlink and uplink frequency bands on a single distributed antenna system.

The DHRU is used to provide cost-efficient wireless signal distribution in areas that have poor coverage. Fiber-span has included additional unique hardware in the DHRU that allows it to both power a local passive DAS plus feed fiber-optic transceivers (FTU).

The downlink port is tapped off the output of the downlink amplifier. The uplink frequencies are combined prior to amplification in the uplink amplifier.

The separate downlink and uplink ports are present on the bottom of the wall mount unit or the rear of the subrack version along with the (Donor) Antenna port and a DAS port.

The following block diagram better illustrates how the DHRU is configured.

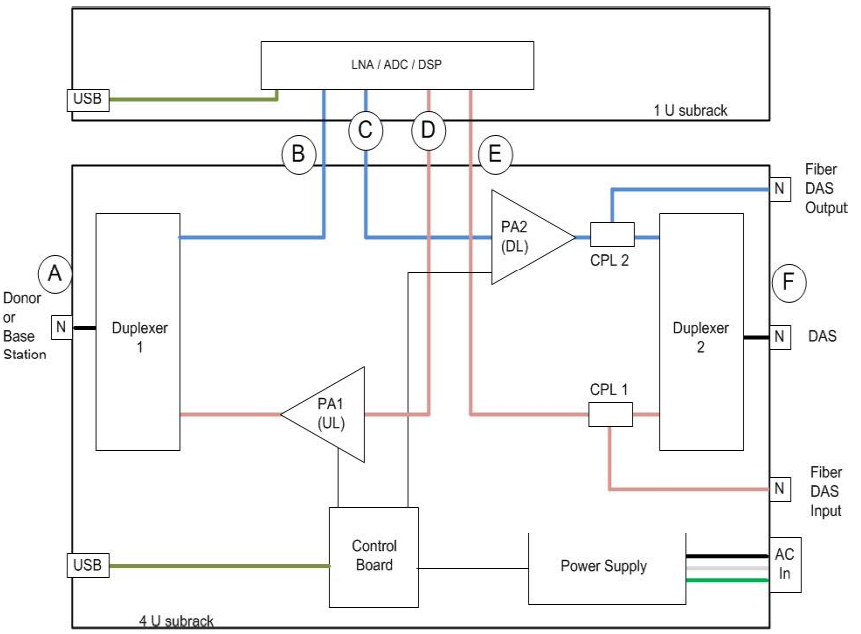


Figure 2. DHRU - Internal Block Diagram

Theory of Operation

The amplifiers used in the RRU provide a set amount of gain. Gain is defined as the ratio in the amount of RF power of the output and input of the amplifier.

If +20dBm of RF power is required at the RF Out port of the RRU and 0dBm is input to the RF Input port at the FTU, the gain must be set to 20dB.

When multiple RF carriers are input to an RF amplifier, the RF output power will be the input power plus the gain.

Power Output = Power input + Gain (in decibels)

Power Output = Power input x Gain (in Watts)

As seen in the following figure, the output power tracks the input power linearly. Eventually as the input power increases, the amplifier output power reaches the output power limit. When this happens, intermodulation products are generated at the amplifier output.

The intermodulation products with the most likelihood of generation are 2nd and 3rd order. For every 1dB increase in input RF power, the 3rd order intermodulation products increase 3dB.

If one were to plot the 3rd order output power on a graph as in the preceding figure, the slope of the 3rd order products would intersect the line of the output power plotted vs. the input power. This point is defined as the 3rd Order Intercept point and is used by amplifier manufacturers to characterize the maximum output power of an RF amplifier.

The RF output power of the amplifiers is defined as the total RF output power inside the bandwidth of the duplexers. This RF output power is divided into the number of dominant RF carriers at the output of the amplifier.

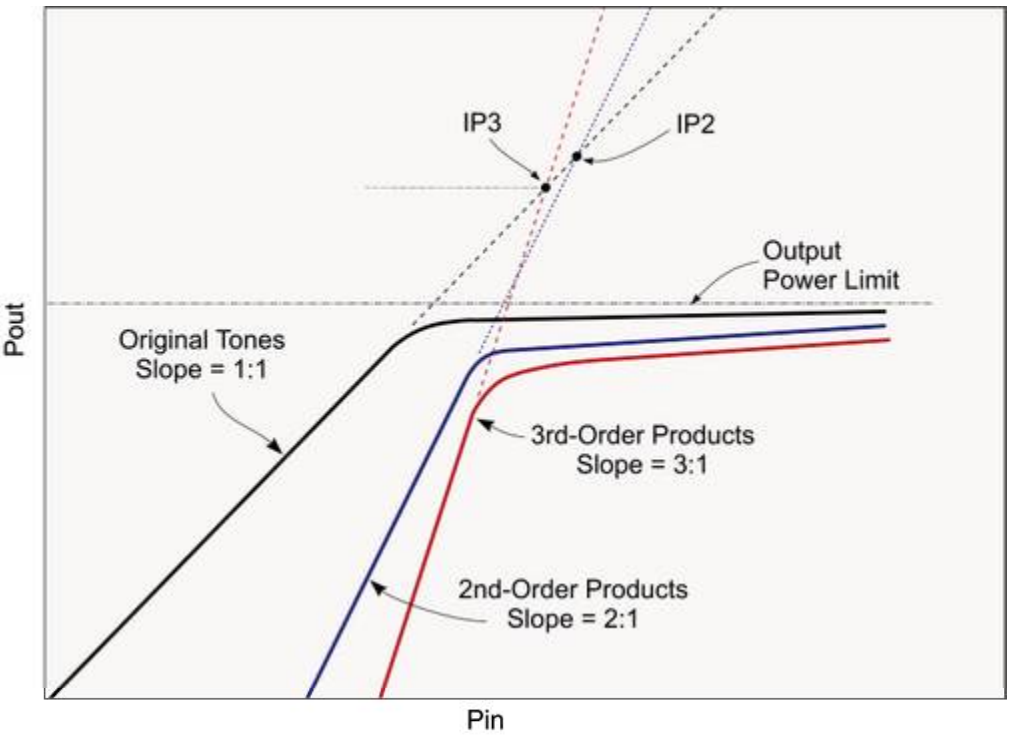


Figure 3. HRU Output Power vs Input Power (IP3 Plot)

Product Applications

The DHRU has several typical applications:

- As a single unit to provide coverage for a single band of wireless service;
- As multiple units amplifying coverage for multiple services;
- As an amplifier to feed fiber-optic transceivers and provide RF wireless coverage using coaxial cable fed from the HRU.

The following diagrams help illustrate a typical coverage solution for a single band of wireless service

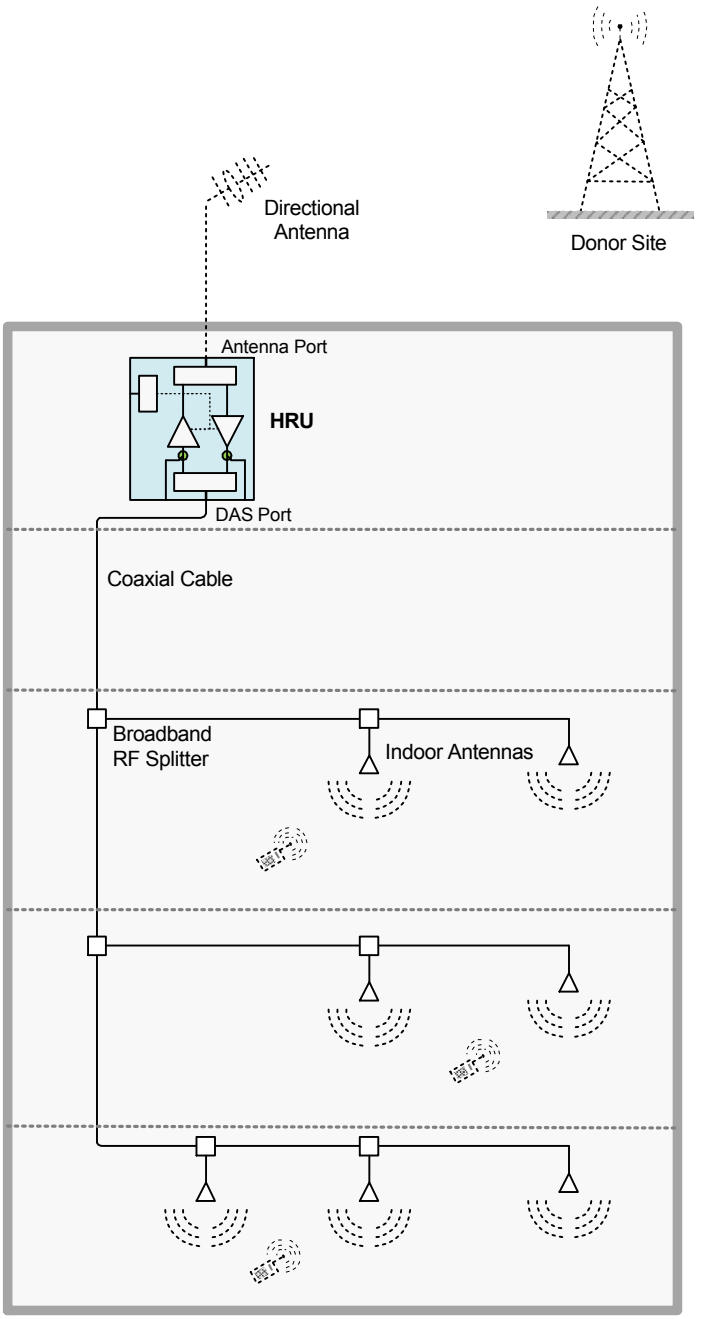


Figure 4. Typical DHRU RF Amplification System (Simplified)

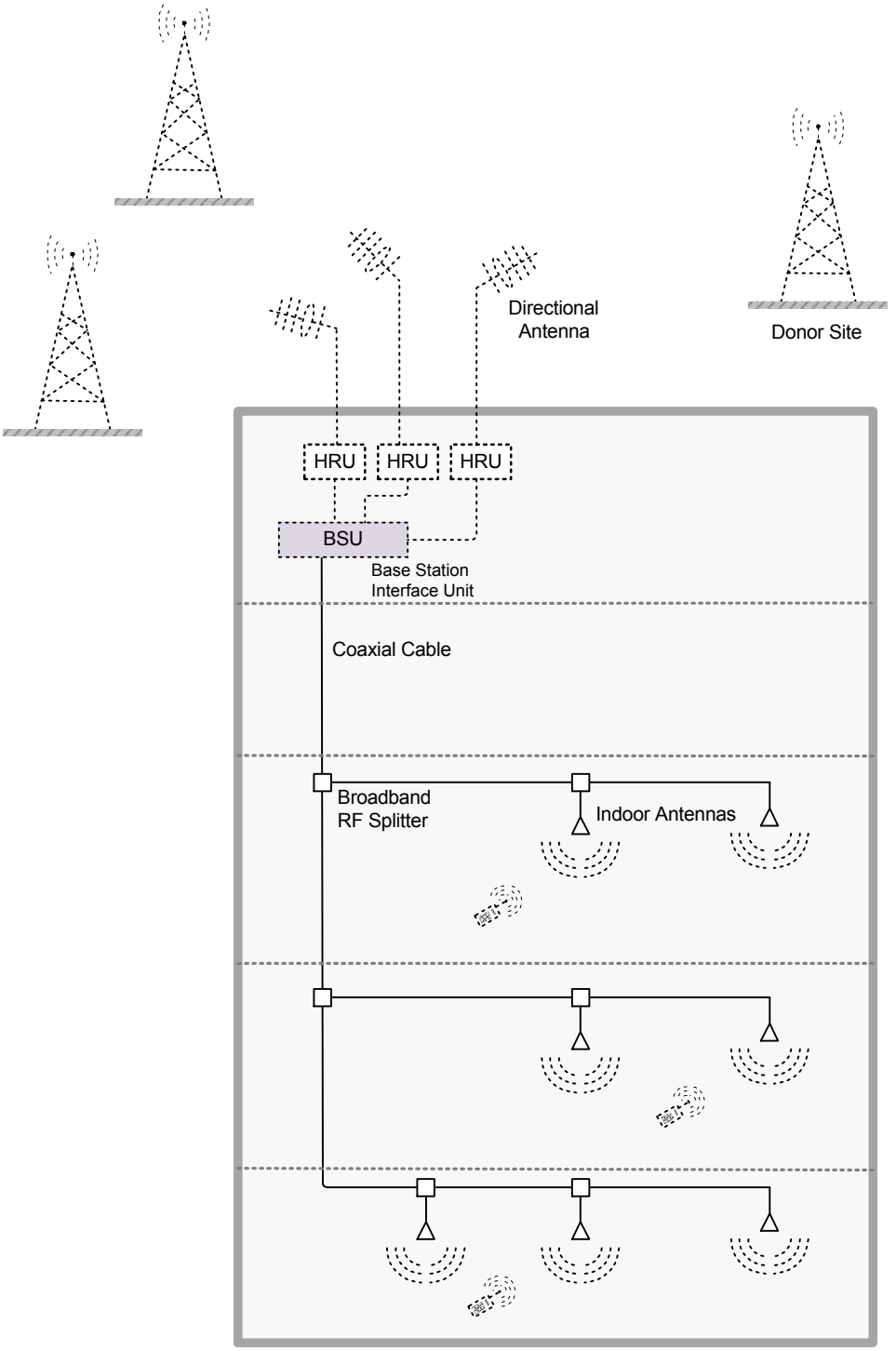


Figure 5. Typical HRU Multi-Service Signal Distribution System

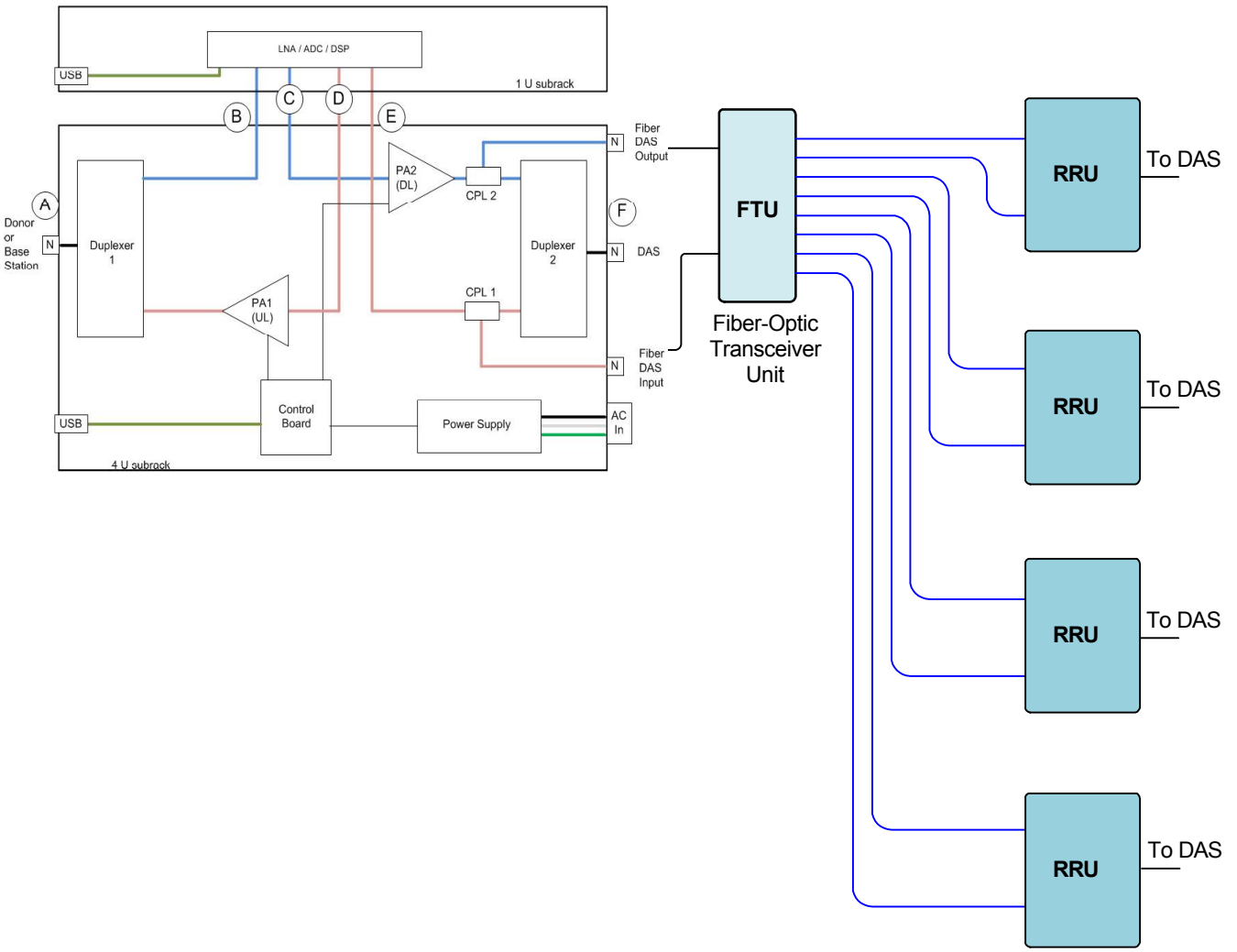


Figure 6. Typical DHRU-to-Multiple RRU Signal Distribution System

3 Detailed Description

Overview

This section deals with the actual components that are assembled to make up the DHRU. The main subassemblies/subsystems are:

1. RF Amplifiers - These provide RF signal amplification.
2. Duplexers - These units separate and combine downlink and uplink frequency spectra, and reduce interference.
3. Digital Signal Processor - Provides settable narrowband filters around eacch incoming channel.
4. Control Board - Provides the USB interface for GUI Program for setting channel centers, filter bandwidths etc. and getting alarms in the DHRU. Also provides a single contact closure summary alarm via the circular connector.
5. Power Supply - This unit converts AC Primary Power to DC Power as required by the active components.
6. GUI-based Monitor & Control Interface - This subsystem offers significant user benefits and capabilities.

   This utility allows the user to optimize the equipment configuration settings and monitor Alarm Status.

Amplifiers

There are two types of amplifiers that Fiber-Span uses to provide the appropriate amount of gain required to provide coverage solutions:

1. LNA – The LNA (low noise amplifier) amplifies the uplink RF signals after they pass through the duplexer. A low noise amplifier with 40dB of gain provides a low noise figure.
2. Power Amp – The output power amplifier provides the downlink gain and has some additional features like ALC (automatic level control) and pre-distortion.

The amplifiers that Fiber-Span utilizes are powered from a DC power supply. The RF amplifiers are type AB broadband. Their current varies with their RF power load.

The power amplifiers employ an Automatic Level Control (ALC) circuit to ensure the RF output power does not destroy the final gain stage of the RF amplifier.

The input signal to the power amplifier can be reduced to prevent the ALC circuit from becoming active. This is done by adjusting the **Attenuator** control available on the GUI Interface.

The amplifiers also employ a form of pre-distortion to allow multiple channels to operate at higher levels with reduced intermodulation signal levels.

The input RF signal into the amplifier is pre-distorted such that after amplification, the intermodulation products are reduced from what would normally be experienced in an amplifier without pre-distortion.

When Power Amplifier (PA) input exceeds ALC range, the power amplifier latches in MUTE mode, meaning the PA is OFF, to protect itself from destructive damage. This state requires technical intervention in order to return the PA to the UNMUTED state:

1. Correct the cause of high level input. This can be done by performing the following: a. Discover and mitigate any input signal(s) causing the over-driven state b. Reduce gain to an appropriate level
2. Using the GUI, MUTE the PA
3. Using the GUI, UNMUTE the PA

Duplexers

The duplexers used in the HRU perform two specific functions:

1. Provide adequate isolation between the downlink and uplink frequency bands to prevent oscillation; and
2. Provide a suitable bandpass characteristic to prevent unwanted interference from/to other donor sites in the area.

The amount of isolation required depends on the overall gain of both the downlink and uplink amplifiers. As the gain increases, so does the isolation requirement and the size of the duplexers.

Fiber-Span provides duplexers that match the existing frequency bands in use. In the 800MHz SMR spectrum, the downlink and uplink frequency bands are 45MHz apart.

The frequency bands are as follows:

800 MHz HRU Frequency Arrangements

Passband	Spectrum
3 MHz	821-824MHz / 866-869MHz
15 MHz	806-821MHz / 851-866MHz
18 MHz	806-824MHz / 851-869MHz

Alarms

The alarms inside the DHRU utilizes a dry contact relay that is normally closed when there are no alarms.

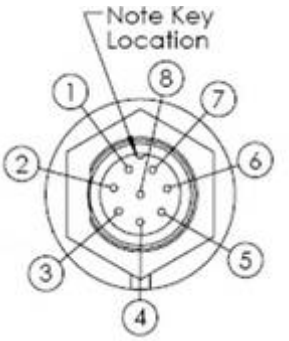
The following alarm conditions will cause the **summary** dry contact relay to **open**:

1. **Power Amp Failure** - When the PA current falls below its designated threshold level, an alarm is triggered.
2. **Door Open** – When the door is opened, a switch is activated that triggers an alarm. Wall mount only.
3. **Power Supply** – When there is no voltage at the power supply, the summary alarm is triggered.

A logical summary output of these alarms is connected to an 8-pin male Switchcraft connector on the bottom of the DHRU.

The pin-out of the male Switchcraft connector is shown in **Figure 7**.

When there is an alarm condition, there is an **open circuit between pins 1 and 2**. This is a **Summary Alarm** indication for any alarm event/condition in the DHRU.



Alarm Connector Pinout

Pin	Desc.	Function
1	N.C.	Local Summary Alarm
2	COM	
3	-	
4	-	
5	-	
6	-	
7	-	
8	-	
Dry Contact Normally Closed When Status is OK		

Figure 7: Alarm Connector Pin-out

GUI Interface

A GUI Interface is available for use in DHRU setup and configuration management. This includes initial configuration of channel frequencies and filter bandwidths, a well as Alarm Monitoring and Control functions.

The GUI software runs on a separate PC, which is connected to the DHRU via USB cable attached to the USB port on the front panel. The Alarms screen is shown in **Figure 8** below.

The device interface is set up by choosing the **COM port** for communications and selecting a device name.

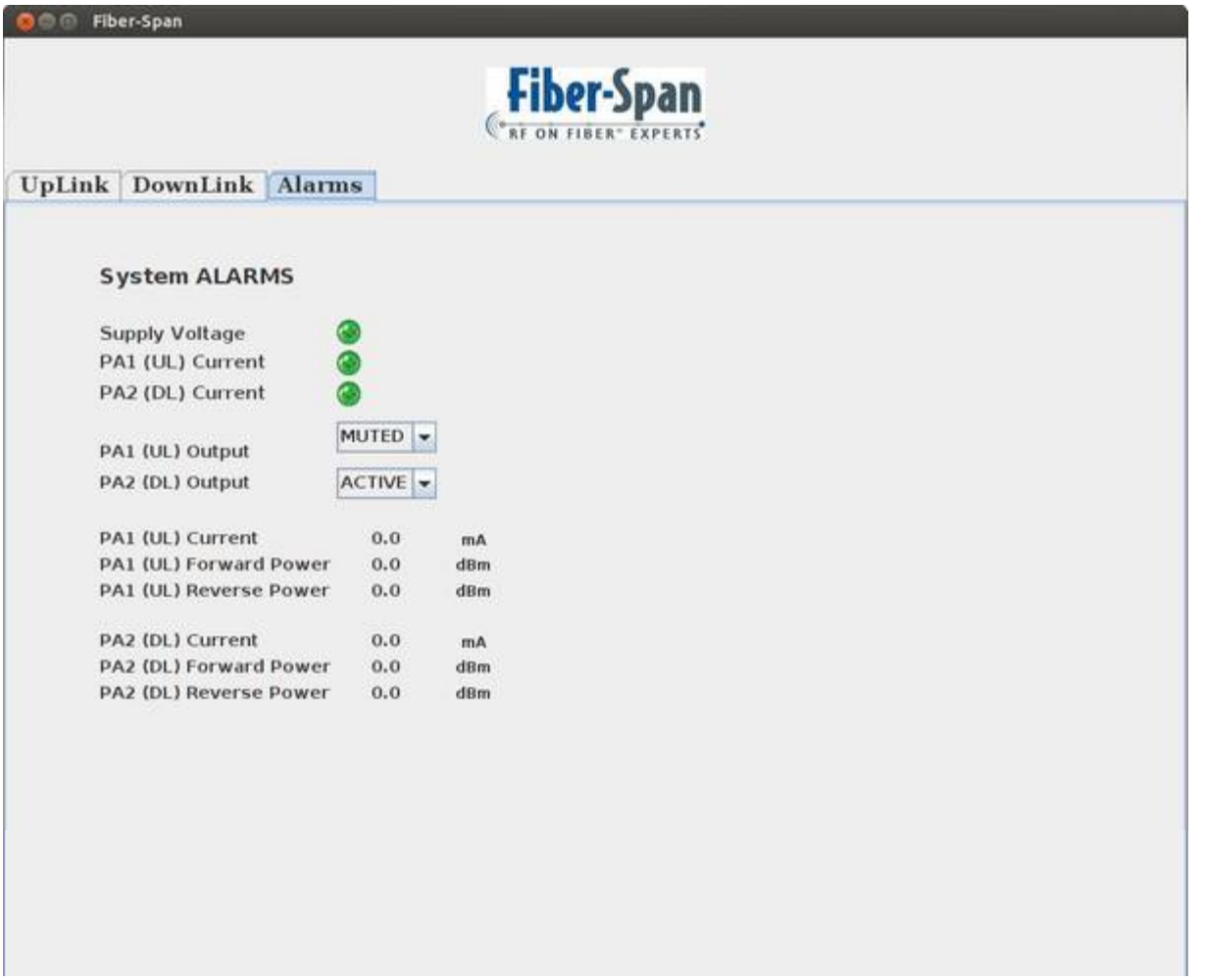


Figure 8: DHRU Settings and Alarms Status GUI Interface

Discrete reported Alarms are as follows:

Local

- PA Current 1 (UpLink)
- PA Current 2 (DownLink)
- Power Supply Voltage

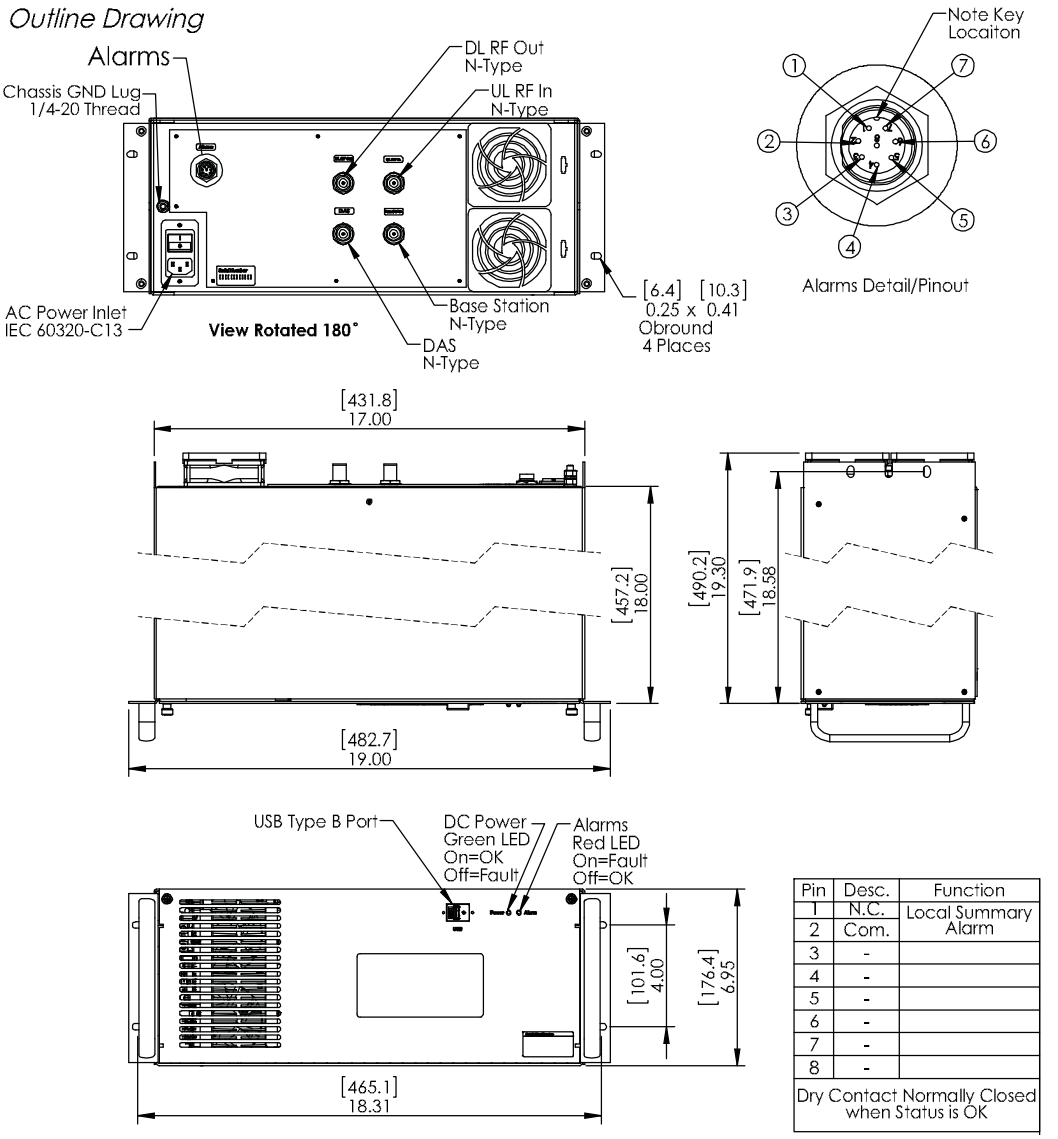
Specifications

The following tables detail the specifications of the 800 MHz G-Series DHRU.

RF Specifications	
Frequency Range	851-869 MHz (Downlink), 806-824 MHz (Uplink)
Gain (typical)	120 dB, adjustable in 1dB steps over a 30dB range
OIP3	63dBm (min)
Noise Figure	7dB
Power per Channel	Refer to Derating Table
Pass Bandwidth	3MHz, 15MHz, 18MHz
Input/Output VSWR	< 2.0:1
Spurious Emission (max)	-20 dBm
RF Connectors	N-Female
Dimensions (WxHxD in.)	19.00 x 6.95h x 19.30 (Standard Rack-mount version)
Weight (lbs)	45 lbs (Standard Rack-mount version)
Mounting Method	Rack-mount Enclosure (4U)
Alarms (Dry Contact Closure or GUI Interface)	1. Summary Alarm normally open, closes upon any alarm within the unit. Pins 1 and 2. 2. GUI Alarms and Controls
MTBF	5 Years
Electrical Parameters	
Power Consumption	190 Watts (1 amplifier); 290 Watts (2 amplifiers)
Primary Power AC Supply	115-230 VAC, 50/60 Hz

Outline Drawings

Dimensions for the Rack-mount configuration are as shown below.



Pin	Desc.	Function
1	N.C.	Local Summary Alarm
2	Com.	
3	-	
4	-	
5	-	
6	-	
7	-	
8	-	

Dry Contact Normally Closed when Status is OK

Figure 9: Outline Drawing - Rack-mount Configuration

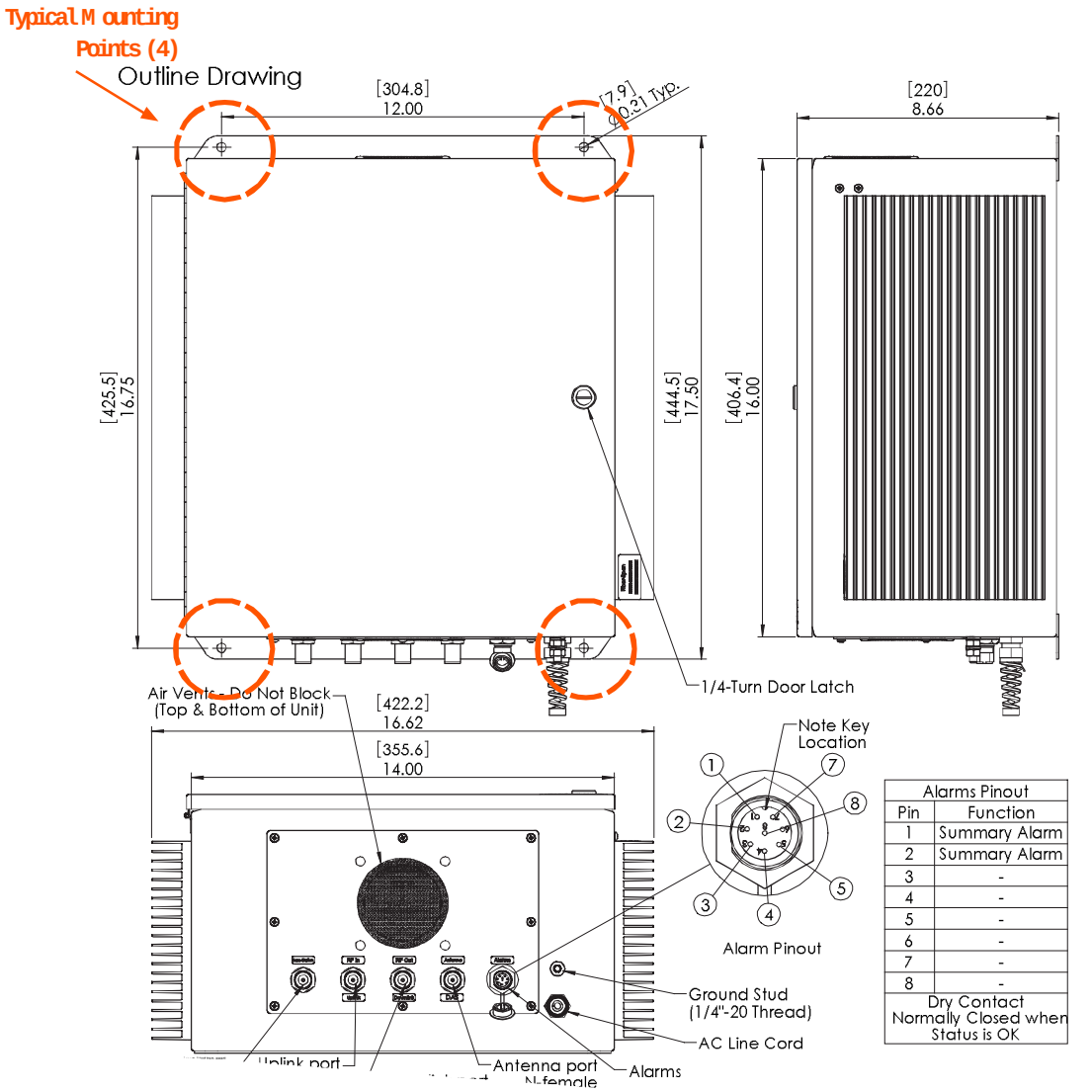


Figure 10: Outline Drawing - Wall-mount Configuration

4 Installation Procedure

Environment

Fiber-Span's DHRU is designed to operate in a controlled environment such as a Telecom room. It is recommended that the temperature inside the room does not exceed +50°C and does not drop below -5°C. The humidity must be 10% to 95%.

Connectorization

The DHRU is supplied with N-female connectors on all RF ports. It is highly recommended that 3 ft. flexible jumper cables such as LMR240 be used to connect the DHRU to the larger hard-line coaxial cable, otherwise the strain on the DHRU's RF ports may result in a damaged connector.

If the DHRU is being used as a simple BDA and the downlink port and uplink port are unused, it is recommended that these ports be terminated with a 50Ω load.

NOTE: If DAS Port is NOT used, it MUST be terminated with a 50 Ω load capable of handling 20 Watts.

Anchoring

Wall-mount Version

Bolts of adequate strength are required to mount the wall-mount HRU which weighs approx. 70lbs with dimensions 16"x14"x9".

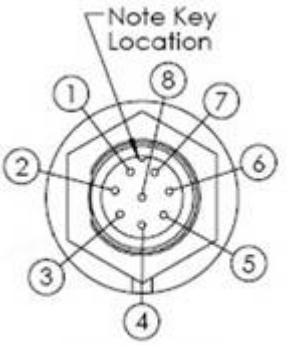
A total of four (4) bolts are needed to mount the DHRU to the wall. The bolt patterns for the DHRUs are shown in the Outline Drawing. See **Figure 10** for example.

Rack-mount Version

Install the rack-mount DHRU on an EIA standard 19" rack using four 10-32 x ¾" screw with Captive Cup washer (Anixter PN 231157 or equivalent). Weight with 2 power amplifiers is 44 lbs.

Alarms

The Alarm port uses an 8-pin male Switchcraft connector and is shown below. The female connector (Switchcraft part # EN3C8FX) kit is included with the DHRU.



Pin Locations

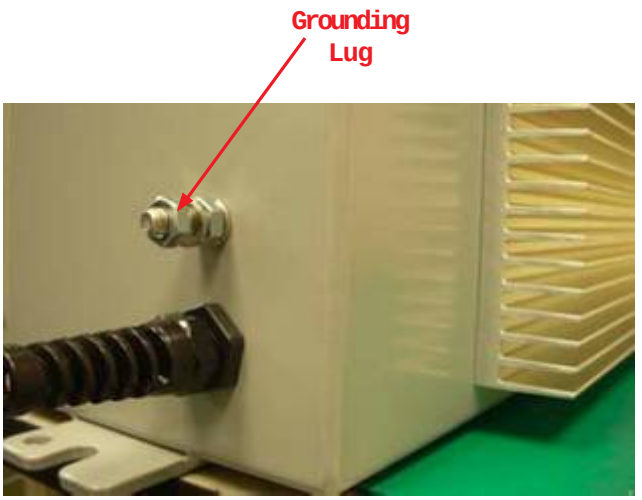
Alarm Connector Pinout		
Pin	**Desc.**	**Function**
1	N.C.	Local Summary Alarm
2	COM	
3	-	
4	-	
5	-	
6	-	
7	-	
8	-	
Dry Contact Normally Closed When Status is OK		

Grounding

The DHRU comes with a grounding lug. A grounding wire of suitable gauge must be used to ground to a common bus bar in the Telecom room according to local and building regulations.

An illustration of the ground lug is shown below for both the wall-mount and rack-mount versions.

Note that the AC power inlet housing at the rear of the Rack-mount chassis contains two in-line slow-blow type fuses (Digi-key P/N F2420-ND).



Grounding Lug at Bottom of Wall-mount Chassis

Grounding Lug at Rear of Rack-mount Chassis

5 Setup Procedure

Overview

Before the unit can be connected to the DAS and powered on, the following cautionary notes must be observed.

Strict adherence to these guidelines will ensure compliance with FCC mandated operational restrictions.

Cautionary Notes

WARNING: Before powering the unit on, it is imperative to measure the downlink composite power level at the Antenna port. When connecting directly to an antenna, the maximum downlink antenna gain must not exceed 4.85 dBd and the cable loss from DAS port to antenna must not be less than 5 dB. The maximum uplink antenna gain must not exceed -2.15 dBd.

WARNING: All RF ports must be properly terminated prior to applying power to these units. Unused RF ports should be terminated with 50 ohms. Failure to properly terminate an RF port may result in damage to the unit.

All output ports must be terminated with a 50Ω load capable of handling **20W** of power before the HRU is powered on. Alternatively, the HRU can be connected to the in-building system assuming the connections are 50Ω with acceptable VSWR (<2.0:1). This will prevent damage to the unit.

Electrostatic Discharge ESD Use caution when touching equipment. Make sure your body has been statically discharged by grounding yourself via an ESD grounding strap. This will prevent damage to sensitive components inside the unit.

WARNING: For DHRUs equipped with fans, make sure that the fans are not blocked, thereby allowing heat energy to escape the enclosure. An DHRU with a blocked fan will exhibit a much lower MTBF.

Contents of Package

With the purchase of any DHRU the following are included when shipped:

- DHRU Product
- DHRU User Manual
- Test Data Sheet showing factory set levels
- Outline Drawing
- Mating Circular Alarm Connector

Additionally, the following items are recommended for Setup and operation:

- Laptop PC
- 6 ft. cable, USB-A to USB-B

DHRU GUI Software

The DHRU software sets all key operational parameters. See Fig 12 for the Alarm / Control Screen:

Alarm / Control Settings

- Supply Voltage Alarm
- Power Amplifier 1 (Uplink) Current Alarm
- Power Amplifier 2 (Downlink) Current Alarm
- Power Amplifier 1 (Uplink) Output Set (Mute)
- Power Amplifier 2 (Uplink) Output Set (Mute)

Diagnostics

- RF Power Amplifier 1 (UL) Current value (mA)
- RF PA1 FWD and REV power detector (dBm)
- RF Power Amplifier 2 (DL) Current value (mA)
- RF PA2 FWD and REV power detector (dBm)

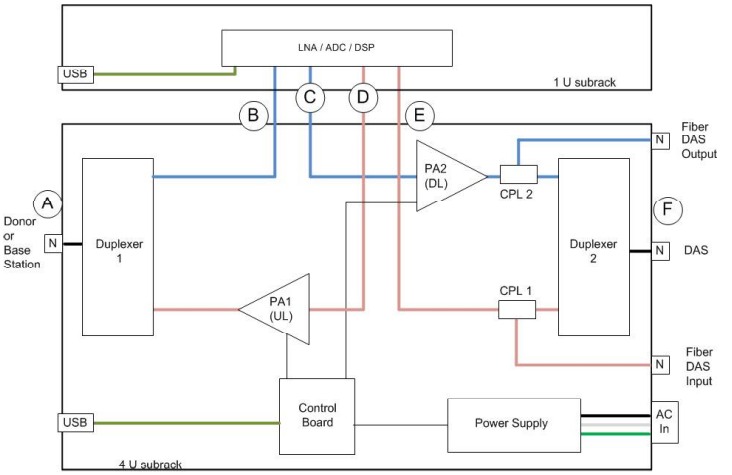


Figure 11: DHRU Signal Paths and Attenuators

Figure 11 illustrates the internal DHRU functional block diagram.

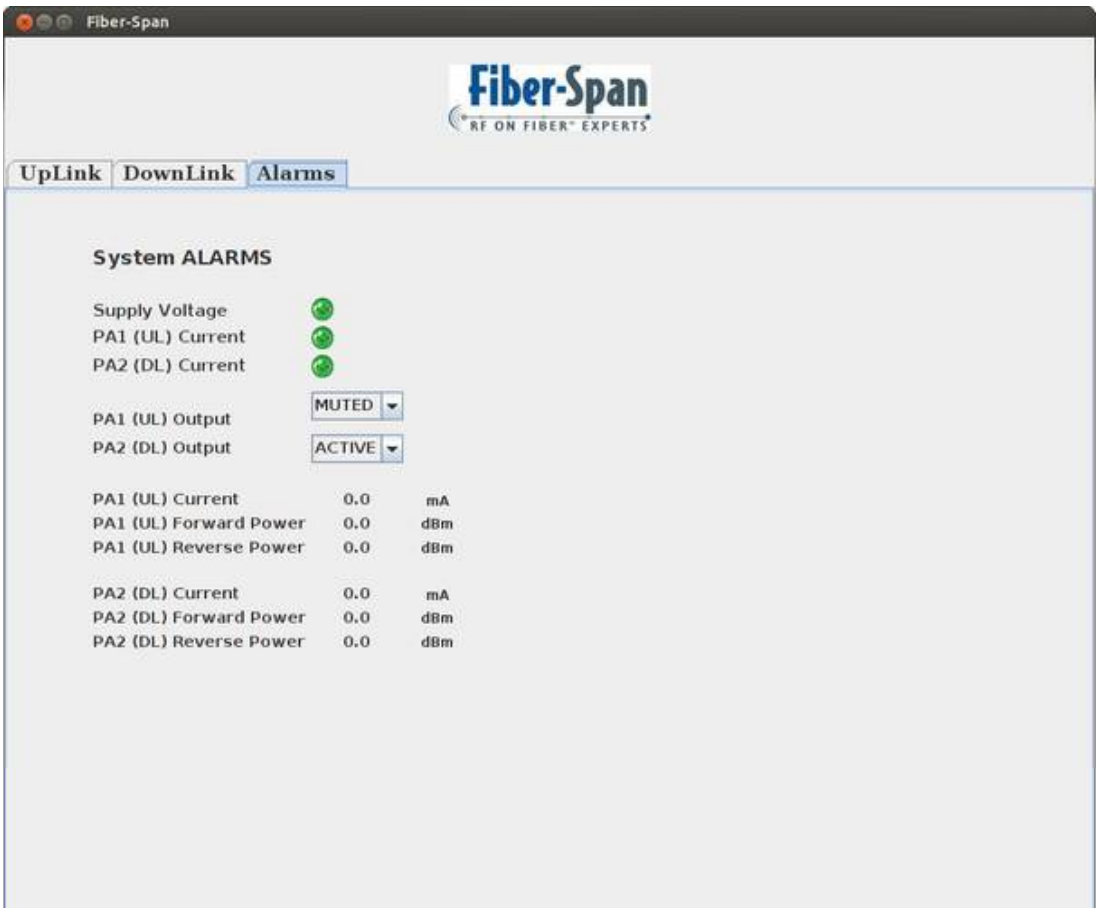


Figure 12: DHRU Alarm & Control GUI Interface

Downlink Setup

To setup the downlink, the following equipment is required:

1. RF signal generator
2. Spectrum analyzer
3. Appropriate jumper cables

The following steps should be observed to properly set up the link.

At the Antenna Port, measure the composite RF signal level delivered by the signal generator (or donor antenna when in the field).

Use a suitable Spectrum Analyzer capable of measuring composite RF within the required bandwidth. The best way to measure the composite signal level is to setup the Spectrum Analyzer to measure the total carrier power within the bandwidth of the downlink amplifier.

Carrier level is not the same as composite power over the bandwidth.

1. Enable a channel in the GUI by setting the test frequency and enabling the channel and ticking the AGC column. Set BW to 25kHz, Gain adjust to 0dB and set Squelch to -90 dBm,
2. Ensure that the measured composite RF signal level at the RF input port is no greater than -10dBm.
3. At the output Antenna Port, measure the composite RF
4. Set gain such that output is approximately +37 dBm (or one channel) by setting the Gain adjust levels in the Downlink GUI page.
5. Measure and verify that the composite RF output power at the DAS port is approximately +37dBm.
6. Note: Factory limit is set to +37 dBm composite output power
7. For a two tone test, repeat steps 1 - 4 for a second frequency. Reduce the output level per the derating on page 20

NOTE: The derating table applies only when the test tones are random (e.g. off air signals) . If test tones are generated by test equipmnet, be sure the two generators do not use a common synchronized clock source. Non-random synchronized signals would require a much more accelerated derating.

NOTE: When connecting directly to an antenna, the maximum downlink antenna gain must not exceed 4.85 dBd and the cable loss from DAS port to antenna must not be less than 5 dB. The maximum uplink antenna gain must not exceed -2.15 dBd.

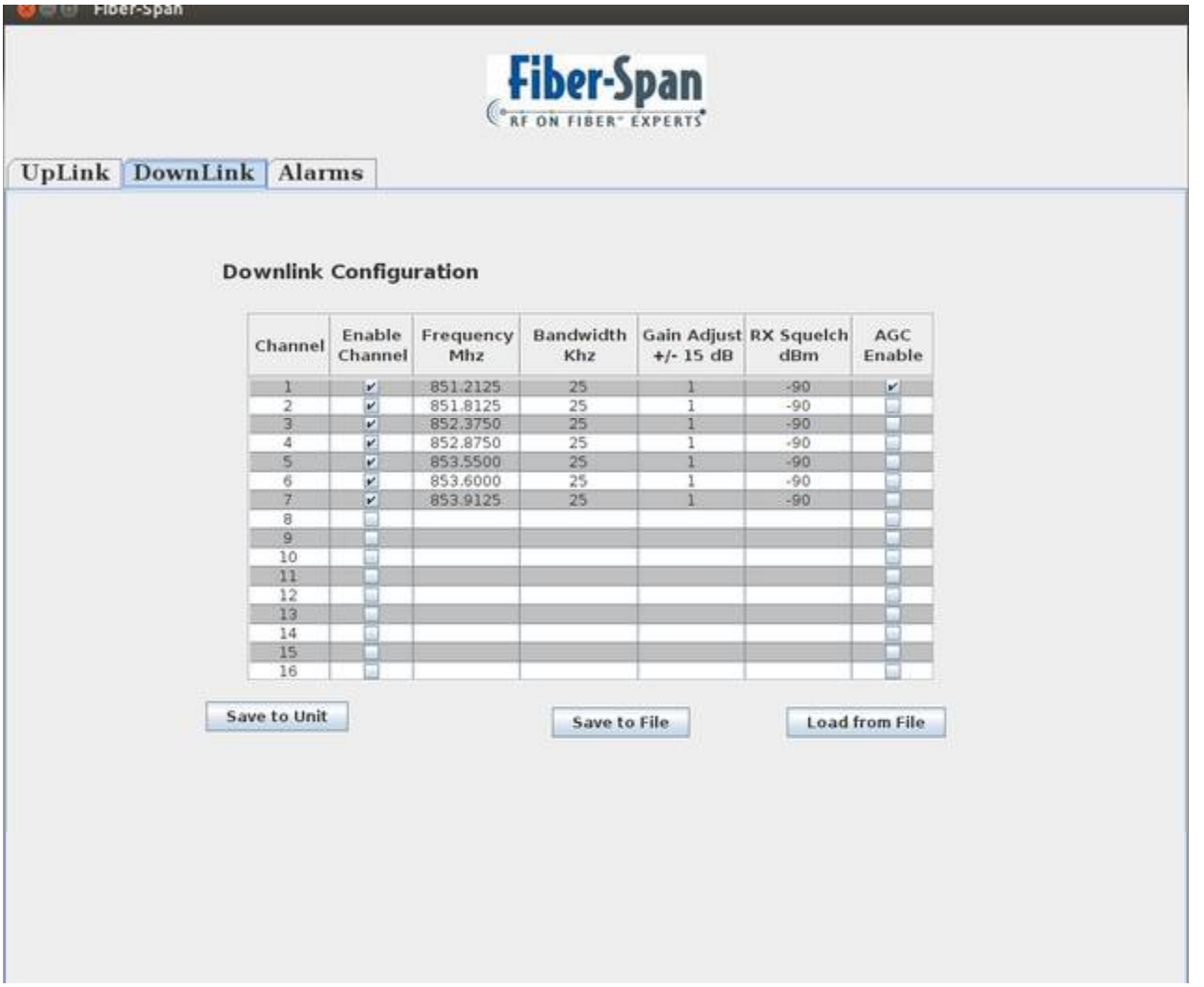


Figure 13: Downlink Control GUI Interface

The HRU Downlink Control shown above gives the user the ability to optimize the Gain setting in the Downlink path. Note: Uplink & Downlink's Bandwidth is factory set per customer's specifications.

De-rating Table

After the downlink gain and the output composite power are set, the power-per-channel must be measured to ensure that the downlink signal level is a high enough at the RF Output port and is sufficient to provide the desired coverage.

The table at right summarizes the power-per-channel de-rating requirements for FM type modulation schemes.

HRU Derating Table

No. of RF Channels	Power per Channel (FM), (dBm)
1	37
2	34
4	31
8	28

DHRU Uplink Control

The DHRU Uplink control and monitoring gives the user the ability to change the gain and set parameters for uplink path optimization.

The settings and diagnostics can be implemented via the local USB port. See **Figure 14**.

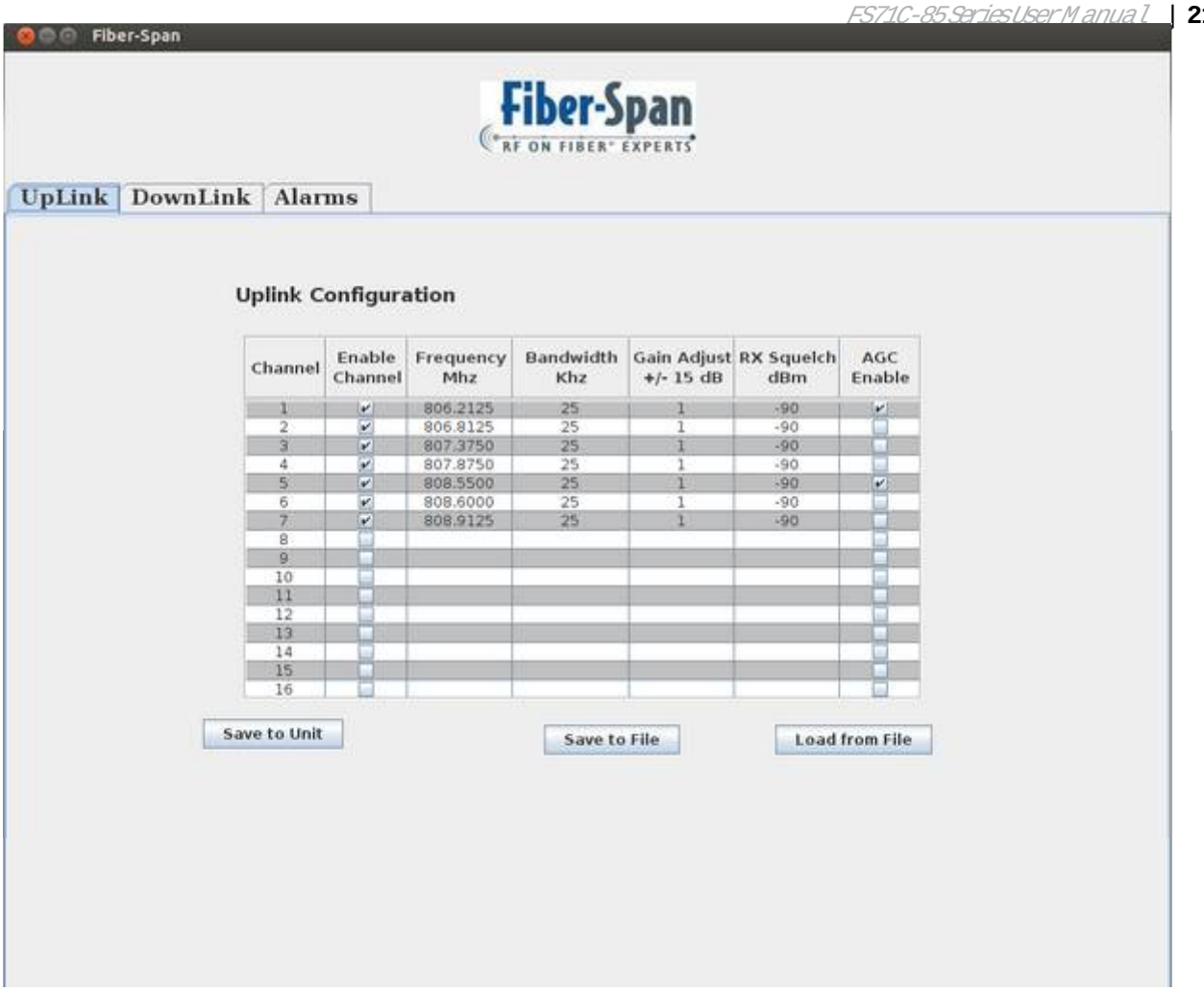


Figure 14: Uplink Control GUI Interface

Uplink Gain Setup

To set up the uplink, the following equipment is required:

1. RF Signal Generator
2. Spectrum Analyzer
3. Appropriate jumper cables

The following steps should be observed to proper set up the link.

1. Using your design link budget, calculate the maximum RF Input the HRU would receive on the DAS port. Factor ALL Channels within band of the HRU at the lowest path loss. The maximum input power should be less than -10 dBm. If this calculated value exceeds -10 dBm, add additional attenuation to the DAS port.

a. 800 MHz Free-Space Path Loss at 1 meter = approximately 30 dB

b. Antenna Network Loss should be about 20 dB (sum of losses from any antenna, over the coax, and through all passive devices)

c. Composite power can be calculated using 10 LOG10 (n) where n = number of channels supported.

2. Set Signal Generator to generate a CW Signal within the Uplink band at an amplitude equal to the value calculated above. Use this generated signal as the input for gain measurement and verification.

3. Set gain such that output = +37 dBm by increasing or decreasing the UPLINK ATTENUATOR in the GUI. Uplink Bandwidth is factory set per customer's specifications.

4. Measure and verify that the composite RF output power at the DONOR port is approximately +37dBm. Note: Factory limit is set to +37 dBm composite output power. When connecting directly to an antenna the maximum uplink antenna gain must not exceed -2.15 dBd.

6 Troubleshooting

DHRU Alarms

DHRU alarms are anunciated with red “LED” indicators in the Graphical User Interface.

See figure 15 below.

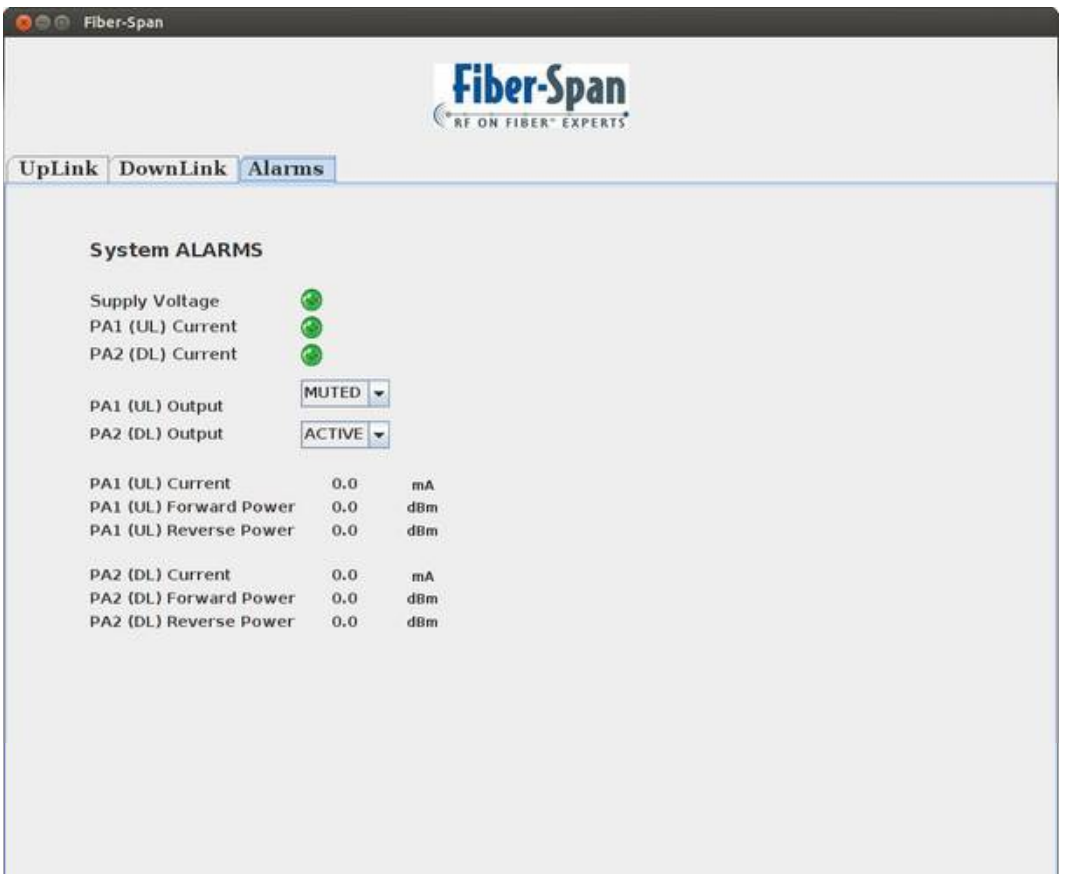


Figure 15. Alarm Status Indicators - GUI Interface

The DHRU software sets all key operational parameters. See Fig 15 for the Alarm / Control Screen:

Alarm / Control Settings

- Supply Voltage Alarm
- Power Amplifier 1 (Uplink) Current Alarm
- Power Amplifier 2 (Downlink) Current Alarm
- Power Amplifier 1 (Uplink) Output Set (Mute)
- Power Amplifier 2 (Uplink) Output Set (Mute)

Diagnostics

- RF Power Amplifier 1 (UL) Current value (mA)
- RF PA1 FWD and REV power detector (dBm)
- RF Power Amplifier 2 (DL) Current value (mA)
- RF PA2 FWD and REV power detector (dBm)

1. POWER AMP CURRENT - Uplink or Downlink

The POWER AMP CURRENT Alarm is triggered when the power amplifier current draw exceeds the threshold. This could occur when:

- PA ALC Failure causes RF Output Power to exceed +37 dBm
- Internal component failure(s) within the PA

Troubleshooting Steps:

a. Using a Spectrum Analyzer or Power Meter and appropriate protective Power-Rated Attenuator(s), measure the RF Output Port for the alarmed PA (DAS Port for Downlink, Donor Port for Uplink). Be sure to account for the protective attenuator(s) in determining output power.

b. If the output power is in excess of +37 dBm, note the value and contact manufacturer Technical Support. The HRU should be switched OFF to prevent potential further damage.

2. SUPPLY VOLTAGE

The SUPPLY VOLTAGE Alarm is triggered when the unit's internal power supply voltage exceeds the high voltage threshold or drops below the low voltage threshold.

Troubleshooting Steps:

a. Check the source power cable's connection to the HRU and verify all connections are properly seated.

b. Using a Multi-meter, verify the electrical power source (outlet) is within the voltage requirements of the HRU's specification sheet. The HRU should be removed from the power source to do this. Note the measured voltage.

c. Plug the HRU into the power source, switch it on, and re-check the SUPPLY VOLTAGE Alarm status again.

d. If the alarm returns, contact manufacturer Technical Support. The HRU should be switched off to prevent further potential damage.

7 Warranty Information

General Warranty

The product carries a standard warranty period of one (1) year unless otherwise indicated on the shipping packages as noted in the purchase order agreement.

Limitations of Warranty

The warranty is limited to the repair or replacement of the defective product. Fiber-Span will decide which remedy to provide for defective components at its own discretion. Fiber-Span shall have a reasonable time after determining that a defective product exists to repair or replace the problem unit.

The warranty applies to repair or replaced products for the balance of the applicable period of the original warranty or ninety (90) days from date of shipment of a repaired or replaced component, whichever is longer.

The Fiber-Span standard warranty does not cover products which have been received improperly packaged, altered, or physically damaged. For example, broken warranty seal, labels exhibiting tampering, physically abused enclosure, broken pins on connectors, any modifications made without Fiber-Span authorization, will void all warranty.

Limitations of Damages

The liability for any defective product shall in no event exceed the purchase price for the defective product. Fiber-Span has no liability for general, consequential, incidental or special damages.

Return Material Authorization (RMA)

No product may be returned directly to Fiber-Span without first obtaining approval from Fiber-Span. If it is determined that the product may be defective, you will be given an RMA number and instructions on how to return the product.

An unauthorized return, i.e., one for which an RMA number has not been issued, will be returned to you at your expense. Authorized returns are to be shipped to the address on the RMA in an approved shipping container.

It is suggested that the original box and packaging materials should be kept if a defective product needs to be shipped back to Fiber-Span.

To request an RMA, please call Fiber-Span at **908.253.9080.**

8 FCC Statement

Manufacturer's Notes

"Changes or modifications not expressly approved by the manufacturer could "Void" the user's authority to operate the equipment".

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

The maximum downlink antenna gain must not exceed 4.85 dBd and the cable loss from DAS port to antenna must not be less than 5 dB. The maximum uplink antenna gain must not exceed -2.15 dBd. The antenna(s) used for this device must be installed to provide a separation distance of at least 100 cm from nearby persons.

To improve and/or correct equipment performance the following can be performed.

1. Re-orient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a different circuit from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/RF technician for help.

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